## ArevaEPRDCPEm Resource

**From:** WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
**Sent:** Wednesday, February 08, 2012 3:09 PM
**To:** Tesfaye, Getachew
**Cc:** BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); KOWALSKI David (AREVA)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 509 (6011), FSAR Ch. 9, Supplement 3
**Attachments:** RAI 509 Supplement 3 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the two questions in RAI No. 509 on October 6, 2011. Supplement 1 and Supplement 2 responses to RAI No. 509 were sent on November 9, 2011 and December 8, 2011, respectively, to provide a revised schedule.

The attached file, "RAI 509 Supplement 3 Response US EPR DC.pdf," provides technically correct and complete final responses to Questions 09.04.01-6 and 09.04.01-7.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Question 09.04.01-7.

The following table indicates the respective pages in the response document, "RAI 509 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 509 — 09.04.01-6 | 2 | 2 |
| RAI 509 — 09.04.01-7 | 3 | 4 |

This concludes the formal AREVA NP response to RAI 509, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

***Dennis Williford, P.E.***
***U.S. EPR Design Certification Licensing Manager***
**AREVA NP Inc.**
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

**From:** WILLIFORD Dennis (RS/NB)
**Sent:** Thursday, December 08, 2011 4:00 PM
**To:** Getachew.Tesfaye@nrc.gov
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 509 (6011), FSAR Ch. 9, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the two questions in RAI No. 509 on October 6, 2011. Supplement 1 response was sent on November 9, 2011 to provide a revised schedule.

The schedule for technically correct and complete responses to these two questions has been changed as provided below.

| Question # | Response Date |
|---|---|
| RAI 509 — 09.04.01-6 | **February 8, 2012** |
| RAI 509 — 09.04.01-7 | **February 8, 2012** |

Sincerely,

***Dennis Williford, P.E.***
***U.S. EPR Design Certification Licensing Manager***
**AREVA NP Inc.**
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

---

**From:** WILLIFORD Dennis (RS/NB)
**Sent:** Wednesday, November 09, 2011 1:52 PM
**To:** Getachew.Tesfaye@nrc.gov
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 509 (6011), FSAR Ch. 9, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the two questions in RAI No. 509 on October 6, 2011.

The schedule for responding to these two questions has been revised as provided below:

| Question # | Response Date |
|---|---|
| RAI 509 — 09.04.01-6 | **December 9, 2011** |
| RAI 509 — 09.04.01-7 | **December 9, 2011** |

Sincerely,

***Dennis Williford, P.E.***
***U.S. EPR Design Certification Licensing Manager***
**AREVA NP Inc.**
7207 IBM Drive, Mail Code CLT 2B

Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

---

**From:** WILLIFORD Dennis (RS/NB)
**Sent:** Thursday, October 06, 2011 2:36 PM
**To:** 'Tesfaye, Getachew'
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 509 (6011), FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 509 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the two questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 509 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 509 — 09.04.01-6 | 2 | 2 |
| RAI 509 — 09.04.01-7 | 3 | 3 |

The schedule for technically correct and complete responses to these questions is provided below.

| Question # | Response Date |
|---|---|
| RAI 509 — 09.04.01-6 | November 9, 2011 |
| RAI 509 — 09.04.01-7 | November 9, 2011 |

Sincerely,

***Dennis Williford, P.E.***
***U.S. EPR Design Certification Licensing Manager***
**AREVA NP Inc.**
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

---

**From:** Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
**Sent:** Tuesday, September 06, 2011 7:06 PM
**To:** ZZ-DL-A-USEPR-DL
**Cc:** ODriscoll, James; Jackson, Christopher; McKirgan, John; Clark, Phyllis; Colaccino, Joseph
**Subject:** U.S. EPR Design Certification Application RAI No. 509 (6011), FSAR Ch. 9

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on August 31, 2011, and on September 6, 2011, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of

RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

**Hearing Identifier:** AREVA_EPR_DC_RAIs
**Email Number:** 3745

**Mail Envelope Properties** (2FBE1051AEB2E748A0F98DF9EEE5A5D4AE8B0A)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 509 (6011), FSAR Ch. 9, Supplement 3
**Sent Date:** 2/8/2012 3:09:15 PM
**Received Date:** 2/8/2012 3:10:08 PM
**From:** WILLIFORD Dennis (AREVA)

**Created By:** Dennis.Williford@areva.com

**Recipients:**
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"KOWALSKI David (AREVA)" <David.Kowalski@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

**Post Office:** auscharmx02.adom.ad.corp

| **Files** | **Size** | **Date & Time** |
|---|---|---|
| MESSAGE | 6117 | 2/8/2012 3:10:08 PM |
| RAI 509 Supplement 3 Response US EPR DC.pdf | 532134 | |

**Options**
**Priority:** Standard
**Return Notification:** No
**Reply Requested:** No
**Sensitivity:** Normal
**Expiration Date:**
**Recipients Received:**

**Response to**

**Request for Additional Information No. 509 (6011), Supplement 3**

**9/06/2011**

**U.S. EPR Standard Design Certification**
**AREVA NP Inc.**
**Docket No. 52-020**
**SRP Section: 09.04.01 - Control Room Area Ventilation System**
**Application Section: 9.4.1**

**QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects)**
**(SPCV)**

**Question 09.04.01-6:**

Clarify the FSAR Tier 1 markup provided in response to RAI 277, Question 09.04.01-1:

With regard to the response of the CRACS to a high radiation condition, the FSAR Tier 1 markup provided in response to RAI 277 Question 09.04.01-1, page 2.6-2, show a deletion of the words “or high radiation alarm signal in the intake duct.” This markup conflicts with the discussion on page 2.6-1 of the same markup which does not delete these words. FSAR Revision 2 Tier 2 page 6.5-5 also discusses isolation on high radiation alarm signal. Please clarify Tier 1. The staff understands that the CRACS will automatically align to maintain a positive pressure in the CRE relative to adjacent areas upon receipt of either a containment isolation signal or a high radiation alarm signal sensed from the intake ducts.

**Response to Question 09.04.01-6:**

Upon receipt of either a containment isolation signal or a high radiation alarm signal sensed at the intake ducts, the main control room air conditioning system (CRACS) automatically aligns to maintain a positive pressure in the control room envelope (CRE), relative to adjacent areas.

In the Response to RAI 277, Supplement 18, Question 09.04.01-1, the phrase “or high radiation alarm signal in the air intake duct” was intentionally deleted in U.S. EPR FSAR Tier 1, Section 2.6.1.6.2 in order to add a separate line item for the actuation on a high radiation alarm signal in U.S. EPR FSAR Tier 1, Section 2.6.1.6.7. This facilitates separate ITAAC for actuation on either a containment isolation signal or high radiation alarm signal sensed at the intake ducts as shown in U.S. EPR FSAR Tier 1, Table 2.6.1-3–Main Control Room Air Conditioning System, Items 6.2 and 6.7.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Question 09.04.01-7:**

Confirm the accident response and function of the low volume purge system for the rod ejection accident:

In your response to RAI 277, Question 09.04.03-3, you provided markups of FSAR Tier 1 and 2 to claim a safety-related function of the CBVS. In the Tier 1 markup on page 2.6-104 you state the CBVS filters exhaust from the containment atmosphere upon receipt of the containment isolation signal until the containment isolation valves close. The staff understands that these CIVs should close automatically within 5 seconds (FSAR Tier 2 paragraph 9.4.7.3). Therefore the staff is unclear if the CBVS tier 1 filtering safety function, as described, is able to reduce off site dosage. In the tier 2 markup on page 9.4-92, you state the safety-related function of the CBVS as, "provides containment isolation and low-flow purge exhaust from the containment isolation valves during a postulated rod ejection accident." Is there a requirement for a containment purge operation using these valves in this particular accident? If so the staff is concerned that the configuration of the low volume purge penetrations do not support operation with a single active failure, since only one containment penetration with two valves in series are supplied. A configuration which is not susceptible to single failure (failure to isolate containment on demand or failure open to purge containment on demand) would necessitate two containment penetrations, with two valves in series.

The staff believes that there is no credited role for containment filtration via the CBVS low volume purge trains in the accident analyses, and that the intent of the design is for the CBVS low accident exhaust filter trains to be optionally aligned and utilized as a back-up to the SBVS safety-related functions. The staff notes that one SBVS safety related function is the establishment of a negative pressure in the Fuel Building and the radiological controlled areas of the Safeguard Building in order to ensure that potentially contaminated air does not escape to the environment (Reference Tier 2 FSAR table 14.3-2). If the CBVS is to act as a backup system for this function, please clarify the safety-related function of the CBVS trains, and propose Technical Specification operability and surveillance requirements to verify operability of the CBVS accident exhaust trains (i.e. provide surveillance requirements to operate the train, do the filter testing, verify system actuation, verify system alignment in accident mode). Propose additional ITACC for the CBVS accident exhaust filter trains in order to test the drawdown time and the negative pressure of the Fuel Building and the Safeguard Building. Alternatively, if filtration via the CBVS filter trains is required to function in a specific DBA, please clarify this function and the accident scenario, and propose technical specification requirements for the CBVS accident exhaust trains. If filtration of containment is required for a specific DBA, include a discussion on how the system meets single failure criteria for this DBA function.

**Response to Question 09.04.01-7:**

In the event the containment building ventilation system (CBVS) low-flow purge is operating and a containment isolation signal occurs, the CBVS will filter air while the containment isolation valves (CIV) close (refer to U.S. EPR FSAR Tier 1, Table 2.6.8-4–Containment Building Ventilation System ITAAC, Items 7.1 and 7.2). No credit is taken for filtration in the dose analysis for accidents involving a loss of reactor coolant system pressure boundary. Credit is taken for CBVS filtration in the rod ejection analysis, but only for the time it takes for the CIVs to close. There is no requirement to reopen the CBVS CIVs and operate the CBVS filtration trains after the initial valve closes.

The sentence in U.S. EPR FSAR Tier 2, Section 9.4.7.3, that was revised in the response to RAI 277, Supplement 18, Question 09.04.03-3, will be clarified to state:

> "The CBVS is an engineered safety feature and the safety-related functions are closure of the CBVS containment isolation valves (CIV) and filtration of the low-flow purge prior to closure of the CIVs during a postulated rod ejection accident."

The CBVS trains do not have a safety-related function to serve as a backup system to the safeguard building (controlled area) ventilation system (SBVS). The SBVS consists of two redundant engineered safety feature filter systems, which are designed to meet design and performance requirements of RG 1.52, ASME N509 and ASME N510.

**FSAR Impact:**

U.S. EPR FSAR Tier 2, Section 9.4.7.3, will be revised as described in the response and indicated on the enclosed markup.

# U.S. EPR Final Safety Analysis Report Markups

on the internal filtration subsystem and containment building cooling subsystem fail to the "as-is" position. The power supply to main fans and reactor pit cooling fans is supplied from corresponding emergency diesel generators. Air cooling unit fans stop in the service compartment cooling subsystem.

*Fuel Handling Accident in the Containment Building*

In the event of a fuel handling accident in the Containment Building, the containment isolation valves on the containment purge subsystem can be manually closed by pushing the emergency push button located in the fuel handling area inside the Containment Building. The dampers are closed when the hatch is opened. The low-flow purge exhaust subsystem is used to avoid the spread of contamination by keeping a negative pressure in the Containment Building. To achieve this safety function, the low-flow purge subsystem exhaust is switched over to the iodine filtration trains of the safeguard building controlled-area ventilation system (refer to Section 9.4.5, Section 11.5.3.1.5, Section 11.5.4.8, and Table 11.5-1, Monitor R-10).

*High Pressure Level or Safety Injection Signal*

In case of high-pressure level or a safety injection signal, the containment penetration valves on the containment purge subsystem are closed and air flow in the Containment Building is stopped.

*Station Blackout*

In the event of an SBO, the reactor pit area is air cooled to prevent degradation of the concrete structure. The reactor pit cooling fans take air from the supply air shaft. The air is supplied to the bottom of the pit and transferred through openings in the pit wall around the main coolant piping to maintain a temperature less than 150°F. The power supply to the reactor pit cooling fans is provided by the ~~alternate AC (AAC)~~ SBO diesel generators.

*Small-Break Loss-of-Coolant Accident and Loss-of-Coolant Accident*

In the event of a small-break loss-of-coolant accident (SBLOCA) or loss-of-coolant accident (LOCA), containment isolation valves automatically close after receipt of the containment isolation signal. These valves are designed to perform their isolation function under LOCA conditions and will close within five seconds after receipt of a containment isolation signal.

### 9.4.7.3 Safety Evaluation

RAI 509, Q. 09.04.01-7

The CBVS maintains proper temperatures in the Containment Building during normal operations and shutdown conditions. Sufficient redundancy is included for proper operation of the system when one active component is out of service. The CBVS is an engineered safety feature and the safety-related functions are closure of the CBVS

containment isolation valves (CIV) and filtration of the low-flow purge prior to closure of the CIVs~~function provides containment isolation and low-flow purge exhaust from the containment isolation valves~~ during a postulated rod ejection accident.

RAI 509, Q. 09.04.01-7

The CBVS low flow purge removes radioactive materials via two 100 percent iodine filtration trains prior to release to the plant vent stack. Each train operates independently. A failure in one train will not prevent the remaining train from providing the required engineered safety feature function.

The containment purge subsystem supply and exhaust penetrations through the containment annulus are equipped with two normally open isolation valves, each connected to separate control trains. A failure in one train will not prevent the remaining isolation valve from providing the required capability. The valves automatically close within five seconds after receipt of a containment isolation signal. The isolation valves and containment penetrations are the only portions of the CBVS that are safety related.

### 9.4.7.4 Inspection and Testing Requirements

The CBVS major components, such as dampers, motors, fans, filters, coils, heaters, and ducts are located to provide access for initial and periodic testing to verify their integrity.

Initial in-place acceptance testing of the CBVS is performed as described in Section 14.2 (test abstracts #073 and #203), Initial Plant Test Program, to verify the system is built in accordance with applicable programs and specifications.

The CBVS is designed with adequate instrumentation for differential pressure, temperature, and flow indicating devices to enable testing and verification of equipment function, heat transfer capability and air flow monitoring.

During normal plant operation, periodic testing of CBVS is performed to demonstrate system and component operability and integrity.

During normal operation, equipment rotation is utilized to reduce and equalize wear on redundant equipment during normal operation.

Isolation dampers are periodically inspected and damper seats replaced as required.

Per IEEE 334 (Reference 9), type tests of continuous duty class 1E motors for CBVS are conducted to ensure ESF system operation and availability.

Fans and air handling units are tested by manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 4, 5, and 6). Air